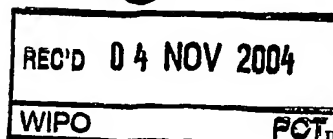




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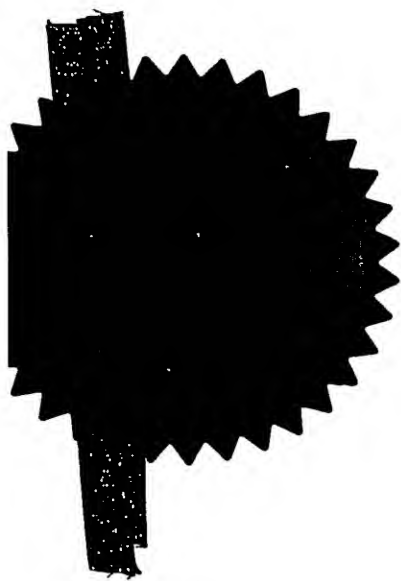
GB04/4436

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

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Signed

Stephen Hordley

Dated

25 October 2004

Patents Form 1/77

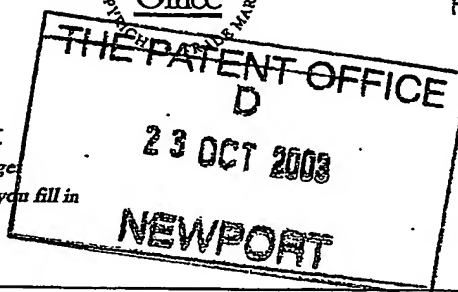
Patents Act 1977
(Rule 16)



23OCT03 0846685-1 D01914
P01/7700 0.00-0324700.4

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)



The Patent Office

Cardiff Road
Newport
South Wales
NP10 8QQ

1. Your reference

MJN/PJE/68218

2. Patent application number

(The Patent Office will fill this part in)

0324700.4

3. Full name, address and postcode of the or of each applicant (underline all surnames)

Jon Shipman Contracting Limited
42 Elliott Road
Love Lane Industrial Estate
Cirencester
Gloucestershire GL7 1YS

Patents ADP number (if you know it)

6842124002

If the applicant is a corporate body, give the country/state of its incorporation

UK (Britain)

4. Title of the invention

TUBING CONNECTION KIT AND METHOD

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

PAGE HARGRAVE
Southgate, Whitefriars
Lewins Mead
BRISTOL BS1 2NT

Patents ADP number (if you know it)

05996483001 ✓

6. Priority: Complete this section if you are declaring priority from one or more earlier patent applications, filed in the last 12 months.

Country

Priority application number
(if you know it)

Date of filing
(day / month / year)

7. Divisionals, etc: Complete this section only if this application is a divisional application or resulted from an entitlement dispute (see note f)

Number of earlier UK application

Date of filing
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8. Is a Patents Form 7/77 (Statement of inventorship and of right to grant of a patent) required in support of this request?

Yes

Answer YES if:

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is not named as an applicant, or
- c) any named applicant is a corporate body.

Otherwise answer NO (See note d)

Patents Form 1/77

9. Accompanying documents: A patent application must include a description of the invention. Not counting duplicates, please enter the number of pages of each item accompanying this form:

Continuation sheets of this form	-
Description	4
Claim(s)	1
Abstract	1
Drawing(s)	3

10. If you are also filing any of the following, state how many against each item.

Priority documents	-
Translations of priority documents	-
Statement of inventorship and right to grant of a patent (Patents Form 7/77)	Two
Request for a preliminary examination and search (Patents Form 9/77)	One
Request for a substantive examination (Patents Form 10/77)	-
Any other documents (please specify)	

11. I/We request the grant of a patent on the basis of this application.

Signature(s)

PAGE HARGRAVE

Date 22/10/03

12. Name, daytime telephone number and e-mail address, if any, of person to contact in the United Kingdom

Mr M J Newstead (0117) 927 6634

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Notes

- If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.
- Write your answers in capital letters using black ink or you may type them.
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- Part 7 should only be completed when a divisional application is being made under section 15(4), or when an application is being made under section 8(3), 12(6) or 37(4) following an entitlement dispute. By completing part 7 you are requesting that this application takes the same filing date as an earlier UK application. If you want the new application to have the same priority date(s) as the earlier UK application, you should also complete part 6 with the priority details.

DUPLICATE

-1-

Tubing Connection Kit and Method

This invention concerns the connection of tubing components to pipes, and has particular relevance to air-conditioning systems.

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The global market for air-conditioning systems has risen dramatically in the last decade and looks set to continue to expand, for example into Eastern Europe. Currently, the most advanced air-conditioning system in common use is the VRV or Variable Refrigerant Volume system. This system comes in two types: "cooling only" which is a two-pipe system, or a three pipe system which performs cooling and heating providing heating through recognised heat-pump technology.

10

A network of pipes is installed around the building to supply refrigerant to the relevant cooling coils ("air handlers") in the required areas. Figure 1 shows a known apparatus for assembly into such a network. A metal tubing component 1 is shown as a bifurcated Y-shaped junction to be connected to a metal pipe 2. The tube component 1 comprises several sections of different diameter, for example the first branch of the junction has two in-line sections X_1 and X_2 , while the second branch has three in-line sections: Y_1 , Y_2 and Y_3 to enable the component to be fitted to various standard, i.e. commercially accepted, sizes of pipe 2. When the component is to be fitted, the diameter of pipe 2 is determined and the correct diameter section of the component 1 is used to enable the pipe 2 to be accommodated within the section. In the figure shown, section X_2 has the correct diameter to allow pipe 2 to be inserted within it. If however pipe 2 was wider, then section X_1 would have to be used. In that case, the component would be cut off at section X_1 to allow insertion of the pipe 2. To fix the pipe 2 within the end section of component 1, the pipe and section are welded together. This is a cumbersome operation, especially since it is necessary to purge the weld region with nitrogen in order to prevent oxidation of the metal. Accordingly, the connection of tubing component 1 to pipe 2 is intricate and subsequently expensive and prone to error and fire risk, and takes an excessively long time to complete.

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It is an object of the present invention to provide a connection kit and method which overcome the above problems. This is achieved by the use of cold jointing means with a correspondingly resized tubing component.

In accordance with a first aspect of the present invention there is provided a kit of parts comprising a tubing component having at least two in-line sections with different external diameters and a set of connection means, each connection means having dimensions such that it may be joined to the tubing component at a respective section.

5

Preferably, each connection means comprises a locking ring.

The kit of parts may be used in fabricating an air-conditioning system.

10 In accordance with a second aspect of the present invention there is provided a method of connecting a tubing component to a pipe comprising the steps of:

providing a tubing component with at least two in-line sections with different external diameters;

selecting a section with a substantially similar diameter to that of the pipe;

15 if the selected section is not at an end of the tubing component, cutting the tubing component in the vicinity of the selected section so that the selected section is at an end of the tubing component;

providing a set of connection means in a range of sizes;

20 selecting a connection means of suitable dimensions for joining to the selected section; and

joining the selected connection means to the tubing component at the selected section.

Preferably, each connection means comprises a locking ring.

25

The invention will now be described by way of example with reference to the following figures, in which:-

Figure 1 shows a conventional pipe assembly;

30 Figure 2 shows unconnected apparatus according to an embodiment of the present invention; and Figure 3 shows the apparatus of the embodiment in a connected state.

Referring now to Figures 2 and 3, an assembly is shown according to an embodiment of the invention. Starting with Figure 2, again it is desired to connect a tubing component 1' to a pipe 2. The tubing component 1' again comprises several sections of various external diameters, for example the in-line sections X_1' , X_2' , X_3' and X_4' of a first branch and in-line sections Y_1' , Y_2' and Y_3' of a second branch. However, with this embodiment the diameters of the sections are set to be standard, i.e. commercially accepted and available, sizes. Since the pipe 2 is also of a standard diameter, it is possible to select a section which has the same diameter as the pipe 2. In the example shown in the figure, section X_2' has the same diameter as the pipe, and therefore the component is cut at section X_2' as shown. Clearly it is also possible to select a section of the second branch to enable this branch to be connected also.

Connection between the component 1' and pipe 2 is achieved by use of a connection means 3, which in the present embodiment comprises a locking ring. A suitable locking ring for this purpose is for example manufactured by Vulkan Lokring, Rohrverbindungen GmbH & Co. KG of Herne, Germany. Connection is achieved by inserting the ends of the pipe and component into the locking ring as shown, the ends being covered with a sealing preparation beforehand if necessary. A compression device is then used to squeeze the two end rings 4 of the locking ring together, which compresses the ends and holds them tightly and sealingly within the connection means. The compression device will preferably comprise a manually operable tool, which uses a ratchet arrangement to assist the user in forcing the rings together. A powered compression device is also available, and both of these devices are manufactured by Vulkan Lokring for example. The connected assembly is shown in Figure 3.

The advantage of using such a connection means is that the join can be done cold, i.e. without welding, thus reducing the complexity, time and cost of the assembly operation. Furthermore, no expensive or complex equipment is needed to fit the connection means.

A plurality of connection means of different sizes will be provided, allowing the tubing component to be fitted to a variety of sizes of pipe by appropriate selection of component width section and connection means.

Although the invention has been described with reference to the embodiments above, there are many other modifications and alternatives possible within the scope of the claims. For example, any suitable cold connection means may be used in place of the locking ring.

CLAIMS

1. A kit of parts comprising a tubing component having at least two in-line sections with different external diameters and a set of connection means, each connection means having
5 dimensions such that it may be joined to the tubing component at a respective section.
2. A kit according to Claim 1, wherein each connection means comprises a locking ring.
3. A kit of parts according to any preceding claim, for use in fabricating an air-conditioning
10 system.
4. A method of connecting a tubing component to a pipe comprising the steps of:
providing a tubing component with at least two in-line sections with different
external diameters;
15 selecting a section with a substantially similar diameter to that of the pipe;
if the selected section is not at an end of the tubing component, cutting the tubing
component in the vicinity of the selected section so that the selected section is at
an end of the tubing component;
providing a set of connection means in a range of sizes;
20 selecting a connection means of suitable dimensions for joining to the selected
section; and
joining the selected connection means to the tubing component at the selected
section.
- 25 5. A method according to Claim 4, wherein each connection means comprises a locking
ring.
6. A kit of parts as hereinbefore described with reference to the figures.
- 30 7. A method of connecting a tubing component to a pipe as hereinbefore described with
reference to the figures.

Abstract

5 A kit of parts comprises a tubing component 1' having at least two in-line sections with different external diameters and a set of connection means 3, each connection means having dimensions such that it may be joined to the tubing component at a respective section X.

Figure 2

10

1/3.

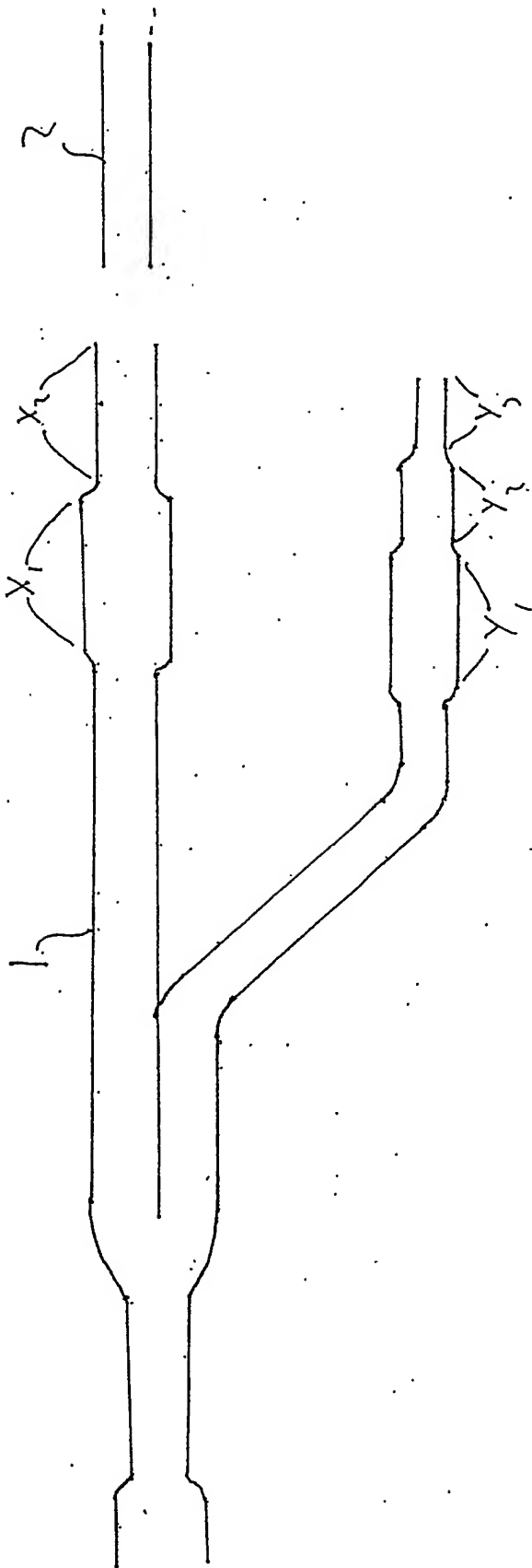


Fig 1 Prior Art

2/3

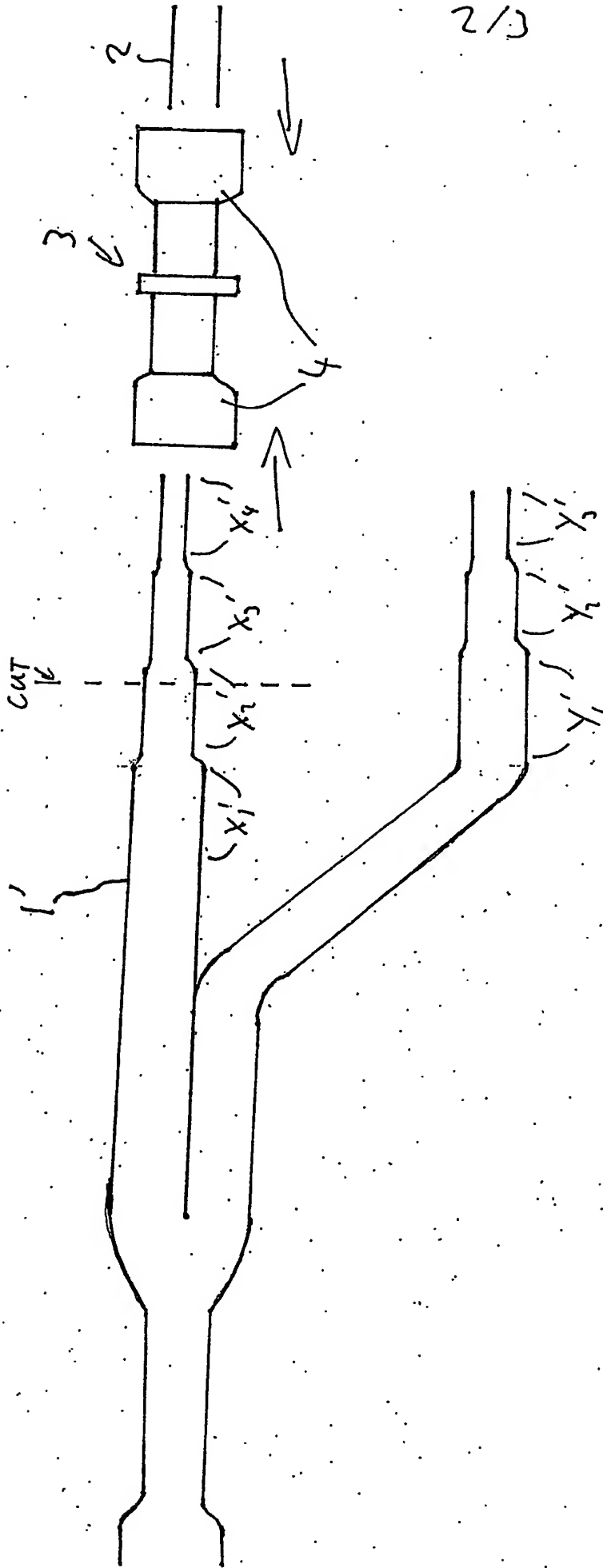
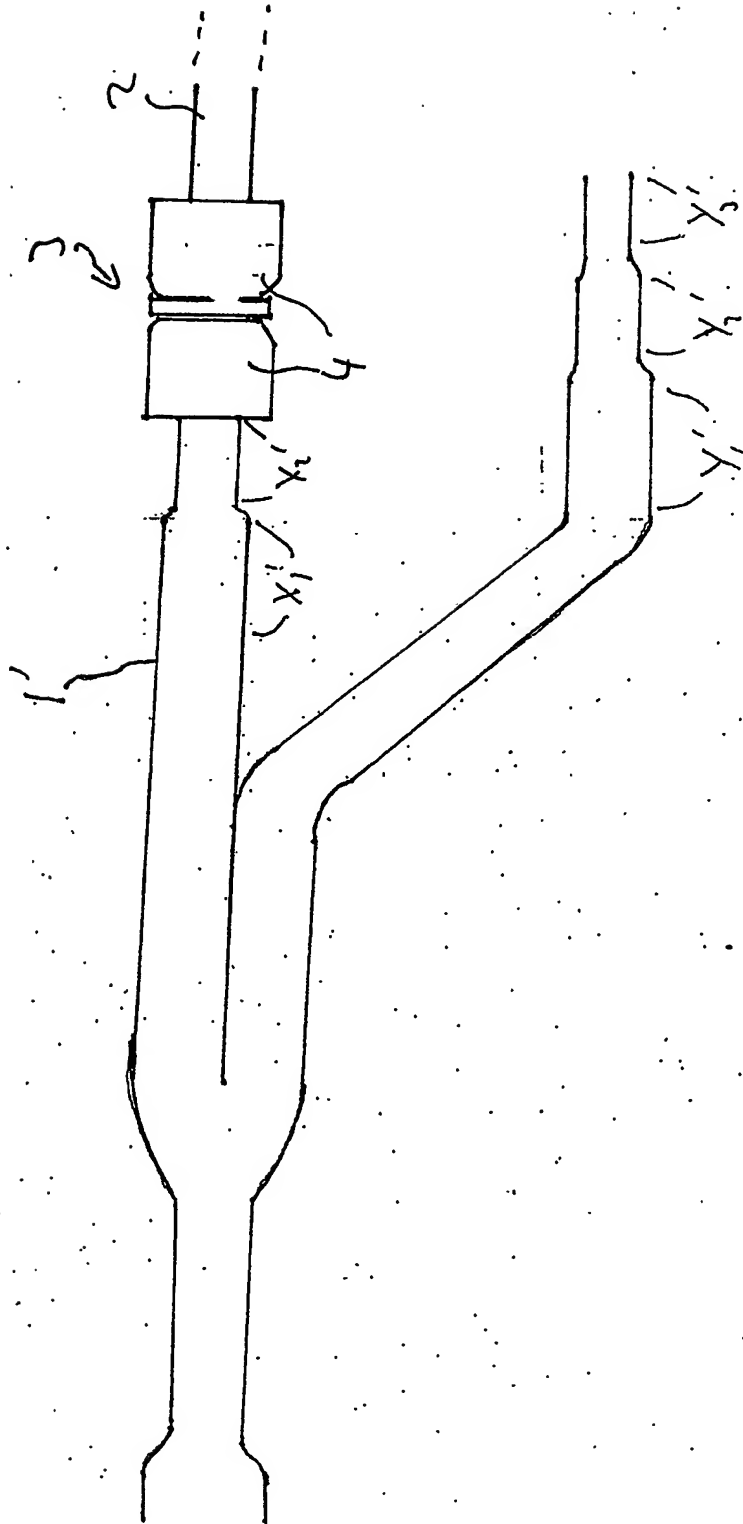


Fig 2

Fig 3

PCT/GB2004/004436

